Date: March 16, 2015

To: Joseph Ebert, AFCEC COR

CC: Don Gronstal, AFCEC; Calvin Cox, CNGS; and Susan Soloyanis, Sologeo

From: Christopher Terpolilli, CB&I Federal Services, LLC.

Subject: Former George AFB - Fall 2015 Basewide Groundwater Sampling Event

The spring 2015 groundwater monitoring event is scheduled for April 2015 and will include gauging the depth-to-water for all groundwater monitoring and extraction wells and analyzing groundwater samples from selected wells for volatile organic compounds (VOCs), general chemistry, and total dissolved solids (TDS). The methods and analytical suites for groundwater sampling are provided in the Draft UFP QAPP (Shaw, 2012a). The list of monitoring wells to be sampled is provided as Table 1.

The overall objectives of this groundwater monitoring event are to:

- Verify compliance with the PSCAP (SS030 and ST067b)
- Verify compliance with the LTMP (OT069)
- Monitor seasonal variation in groundwater elevation and flow patterns, and
- Monitor concentrations and areal extent of contaminants of concern (COCs).

There are nine sites associated with this basewide groundwater monitoring event: LF012, LF014, LF044, OT069, SS030, SS084, ST067b, OT071, ZZ051 and CG070. Some of the monitoring wells are also used to monitor multiple plumes and the data collected will be used for reporting on more than one site. The list of monitoring wells to be sampled was determined based on the rationale provided in the Groundwater Monitoring Decision Tree (Figure 2-1; Shaw 2013) and an evaluation of historical results or the requirements of a site-specific long-term monitoring plan (LTMP). Table 1 includes the well identification, aquifer, screen depth, associated site(s), analysis to be performed and rationale for sampling in April 2015.

LF012. Site LF012 is an abandoned landfill covering approximately 12 acres on the eastern side of the Base and is part of OU3. Groundwater associated with LF012 is currently sampled annually and analyzed for VOCs, chloride, nitrate, sulfate, and total dissolved solids. Due to variability in the analytical results of indicator parameters, the Draft OU3 Landfills LTMMP Amendment #3 recommended two rounds of groundwater sampling for additional geochemical parameters including

calcium, magnesium, sodium, potassium, and alkalinity in order to assess major ion equilibrium and enable completion of a geochemical evaluation. Based on the geochemical evaluation, a fourth round of groundwater sampling for calcium, magnesium, sodium, potassium, alkalinity, sulfide, and ferrous iron is recommended to provide additional support for the geochemical evaluation. Figure 1 identifies the four (4) wells in the Lower Aquifer beneath LF012 that will be sampled for the third round of VOCs and geochemical parameters in April 2015.

LF014. Site LF014 is a landfill covering approximately 50 acres in the northeastern portion of the Base and is part of OU3. Groundwater associated with LF014 is currently sampled annually and analyzed for VOCs, chloride, nitrate, sulfate, and total dissolved solids. Figure 1 identifies the four (4) wells in the Lower Aquifer beneath LF014 that will be sampled for VOCs and geochemical parameters in April 2015.

LF044. Site LF044 is an abandoned landfill covering approximately 0.5 acres in the northeastern portion of the Base and is part of OU3. Groundwater associated with LF044 is currently sampled annually and analyzed for VOCs, chloride, nitrate, sulfate, and total dissolved solids. Figure 1 identifies the three (3) wells in the Lower Aquifer beneath LF044 that will be sampled for VOCs and geochemical parameters in April 2015.

OT069/SS030/SS084. Site OT069 is a chlorinated VOC groundwater plume present in the Upper Aquifer beneath the flight line area that is part of OU3. The LTMP for Site OT069 entails annual sampling to monitor the chlorinated solvent plume. Note that a small number of OT069 5-year review wells were missed during the October 2014 Basewide sampling event. As such, all 5-year wells will be resampled during the upcoming April 2015 event. Site SS030 is a non-CERCLA site that contains a freeproduct and a dissolved-phase petroleum hydrocarbon plume present in the Upper Aquifer beneath the flightline area. Site SS030 also contains a MTBE plume in the Upper Aquifer beneath SS084. Figure 1 identifies the forty-seven (47) wells that will be sampled for VOCs (and geochemical parameter depending on site) in April 2015.

ST067b. Site ST067b is a non-CERCLA site that contains a free product and a dissolved-phase JP-4 plume present in the Upper Aquifer and is located in the southwestern portion of the Base. Monitoring wells associated with the ST067b site will not be sampled for dissolved constituents if free product is observed while gauging the depth-to-water. Figure 1 identifies the thirty-eight (38) wells that will be sampled for VOCs and geochemical parameters in April 2015. Note that this number includes some wells that are shared with Site OT071 and will also be sampled for dieldrin (Table 1)

OT071. Site OT071 is a dieldrin groundwater plume present in the Upper and Lower Aquifers in the southeast portion of the Base. Figure 1 identifies the twenty-two (22) wells in the Upper and

Lower Aquifers that will be sampled for dieldrin in April 2015. Note that this number includes some wells that are shared with Site ST067b and will also be sampled for VOCs and geochemical parameters (Table1).

ZZ051. Site ZZ051 contains petroleum COCs in soil, soil vapor, and groundwater located in the western portion of the Base and is part of OU3. Figure 1 identifies the four (4) wells in the Upper Aquifer that will be sampled for VOCs in April 2015.

CG070. Site CG070 consists of a TCE groundwater plume present in the Upper and Lower Aquifers in the northeastern portion of the former George AFB and is part of OU1. Figure 1 identifies the one well that will be sampled for VOCs in April 2015 in the Lower Aquifer.

In summary, a total of 117 wells will be sampled during the upcoming April 2015 basewide groundwater monitoring event, and sample analysis will include 102 VOC samples, 56 general chemistry samples, and 27 dieldrin samples (Table 1). All of the wells will be gauged for depth-to-water or depth-to-product. Gauging and groundwater monitoring will be performed in accordance with the Draft UFP-QAPP (Shaw, 2012a). Sampling results from the April 2015 groundwater monitoring event will be reported in the 2015 Basewide Annual Monitoring and Operations Report for CERCLA and Non-CERCLA Sites.

Tables

Table 1 – Monitoring Well Summary, April 2015 Basewide Groundwater Monitoring Event

Figures

Figure 1 – Wells to be Sampled, April 2015

References

MWH, 2011, ***Final 2010 Basewide Annual Monitoring and Operations Report for CERCLA and Non-CERCLA Sites, George Air Force Base, California,*** August.

MWH, 2012, ***Final 2011 Basewide Annual Monitoring and Operations Report for CERCLA and Non-CERCLA Sites, George Air Force Base, California,*** August.

Shaw, 2013, ***Final 2012 Basewide Annual Monitoring and Operations Report for CERCLA and Non-CERCLA Sites, George Air Force Base, California,*** May.

Shaw, 2012a, ***Draft Uniform Federal Policy (UFP) Quality Assurance Project Plan (QAPP) Quality Program Plan – Volume 1, Former George Air Force Base, Victorville, California,*** August.

TABLES

Table 1

Monitoring Well Summary
April 2015 Basewide Groundwater Monitoring Event
Former George Air Force Base, California

Monitoring Well	Aquifer	Screen (ft bgs)	Associated Site	VOCs	Nitrate	GEO	GEO Extra	Dieldrin	Rationale
ADELANTO-4								•	
MW-1-OU3	U	113-143	ZZ051	•					Monitor benzene concentrations near ZZ051
MW-02	U	119-149	SS030	•					Monitor upgradient edge of SS030 plume
MW-04	U	119-149	SS030	•					Monitor within SS030 benzene plume
MW-13	U	120-160	SS030	•					SS030 PSCAP compliance well
MW-16	U	120-160	OT069, SS030	•					Monitor upgradient edge of SS030 plume; OT069 LTMP well, 5-year review sampling
MW-21	U	120-160	OT069, SS030	•					SS030 PSCAP compliance well
MW-23	U	120-160	SS030	•					Monitor area between ST054 and ST057; downgradient of LNAPL at MW-10; SS030 PSCAP compliance well
MW-26	U	120-160	OT069, SS030	•					SS030 PSCAP compliance well
MW-28	U	120-160	OT069	•		•	•		OT069 LTMP well, 5-year review sampling; SS030 PSCAP compliance well
MW-29	U	120-160	SS030	•					Monitor east of ST054 and north of LNAPL at MW-103-OU2; SS030 PSCAP compliance well
MW-30	U	120-160	OT069	•					OT069 LTMP well, annual sampling
MW-31	U	120-160	OT069	•					OT069 LTMP well, annual sampling; SS030 PSCAP compliance well
MW-33	U	120-160	OT069, SS030	•					SS030 PSCAP compliance well
MW-34	U	120-160	OT069, SS030	•					SS030 PSCAP compliance well; OT069 LTMP well
MW-35	U	115-155	OT069	•		•	•		OT069 LTMP well, 5-year review sampling
MW-36	U	120-160	OT069, SS030	•					Clean well downgradient of SS030 and OT069 plumes; OT069 LTMP well, 5-year review sampling;
MW-38	U	119.76-	OT069, SS030	•					SS030 PSCAP compliance well
MW-39	U	119-159	SS030	•					Clean well upgradient of SS030 and OT069 plumes: SS030 PSCAP compliance well
MW-40	U	118.67-159	OT069, SS030	•					SS030 PSCAP compliance well
MW-42	U	120-160	SS030	•					SS030 PSCAP compliance well
MW-43	U	118-158	OT069, SS030	•					SS030 PSCAP compliance well; OT069 LTMP well
MW-44	U	120-160	OT069	•		•	•		OT069 LTMP well, 5-year review sampling
MW-45	U	120-160	OT069, SS030	•					Monitor within SS030 benzene plume, also OT069 LTMP well; SS030 PSCAP compliance well
MW-46	U	115-155	OT069, SS030	•					SS030 PSCAP compliance well
MW-47	U	115-155	OT069, SS030	•					OT069 LTMP well, 5-year review sampling; SS030 PSCAP compliance well
MW-48	U	120-160	OT069	•					OT069 LTMP well, annual sampling
MW-49	U	120-160	OT069	•		•	•		OT069 LTMP well, 5-year review sampling
MW-51	U	110-140	OT069	•		•	•		OT069 LTMP well, 5-year review sampling
MW-55	U	165-175	SS030	•					Monitor deep portion of the eastern perimeter of SS030 benzene plume; SS030 PSCAP compliance well
MW-57	U	120-160	OT069, SS030	•					SS030 PSCAP compliance well
MW-58	U	120-160	OT069, SS030	•					Monitor eastern perimeter of SS030 benzene plume; OT069 LTMP well, annual sampling; SS030 PSCAP compliance well
MW-61	U	120-160	OT069, ST067b	•					Monitor upgradient of ST067b plume; OT069 LTMP well, 5-year review sampling
MW-69	U	120-140	SS030, SS084	•					Monitor within SS084 MTBE plume
MW-70B	U	122-142	SS030, SS084	•					Monitor northeast of SS084 MTBE and SS030 benzene plumes; SS030 PSCAP compliance well
MW-71	U	121-141	OT069, SS030, SS084	•					Monitor northeast of SS084 MTBE and SS030 benzene plumes; OT069 LTMP well, annual sampling; SS030 PSCAP compliance well
MW-74	U	153.4-158.4	OT069, SS030	•		•	•		OT069 LTMP well, annual sampling
MW-75	U	121-161	OT069	•					OT069 LTMP well, annual sampling
MW-88	U	118-183	OT069, SS030	•		•	•		OT069 LTMP well, 5-year review sampling
MW-91	U	117-132	OT069	•					OT069 LTMP well, annual sampling
MW-99	U	119-134	SS030	•					SS030 PSCAP compliance well
MW-109	U	109-135	SS030	•					Monitor northweastern perimeter of SS030 benzene plume; SS030 PSCAP compliance well
MW-110	U	110-135	SS030	•					Monitor eastern perimeter of SS030 benzene plume
MW-111	U	107-127	SS030	•					SS030 PSCAP compliance well
MW-112	U	115-140	SS030	•					Monitor western perimeter of SS030 benzene plume; SS030 PSCAP compliance well

Table 1

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April 2015 Basewide Groundwater Monitoring Event
Former George Air Force Base, California

Monitoring Well	Aquifer	Screen (ft bgs)	Associated Site	VOCs	Nitrate	GEO	GEO Extra	Dieldrin	Rationale
MW-113	U	109-134	SS030	•					Monitor northwestern perimeter of SS030 benzene plume; SS030 PSCAP compliance well
MW-114	U	115-140	SS030	•					Monitor area between ST054 and ST057; SS030 PSCAP compliance well
MW-115	U	110-140	SS030	•					SS030 PSCAP compliance well
MW-116	U	140-160	ST067b	•		•	•		ST067b PSCAP compliance well
MW-117	U	140-160	ST067b	•		•	•		Monitor benzene concentrations with ST067b plume; ST067b PSCAP compliance well
MW-118	U	140-160	ST067b	•		•	•		ST067b PSCAP compliance well
MW-119	U	140-160	ST067b	•		•	•		ST067b PSCAP compliance well
MW-120	U	145-165	ST067b	•		•	•		ST067b PSCAP compliance well
MW-121	U	132-152	ST067b	•		•	•		Monitor upgradient of the ST067b benzene plume; ST067b PSCAP compliance well
MW-123	U	146-161	ST067b	•		•	•	•	Monitor downgradient of ST067b benzene plume; ST067b PSCAP compliance well
MW-124	U	135-155	ST067b	•		•	•		Monitor downgradient of ST067b benzene plume; ST067b PSCAP compliance well
MW-125	U	143.5-163.5	ST067b	•		•	•		ST067b PSCAP compliance well
MW-126	U	142-162	ST067b	•		•	•		ST067b PSCAP compliance well
MW-127	U	140.5-165.6	ST067b	•		•	•		ST067b PSCAP compliance well
MW-128	U	145-165	ST067b	•		•	•		ST067b PSCAP compliance well
MW-129	U	142-157	ST067b	•		•	•		ST067b PSCAP compliance well
MW-130	U	146-161	ST067b	•		•	•		ST067b PSCAP compliance well
MW-131	U	157-172	ST067b	•		•	•		Monitor southeastern extent of ST067b benzene plume; ST067b PSCAP compliance well
MW-132	U	157-172	ST067b	•		•	•		Monitor benzene concentrations with ST067b plume; ST067b PSCAP compliance well
MW-133	U	140-155	OT069, ST067b	•		•	•		Monitor downgradient of ST067b plume; ST067b PSCAP compliance well; OT069 LTMP well
MW-134	U	145-160	ST067b	•		•	•		Monitor southwestern extent of ST067b benzene plume; ST067b PSCAP compliance well
MW-136	U	155-170	ST067b, OT071	•		•	•	•	Monitor downgradient edge of Upper Aquifer dieldrin plume; ST067b PSCAP compliance well
MW-137	U	160-185	ST067b	•		•	•	•	ST067b PSCAP compliance well
MW-138	U	137-152	ST067b	•		•	•		ST067b PSCAP compliance well
MW-139	U	148-161	ST067b	•		•	•		ST067b PSCAP compliance well
MW-140	U	148-168	ST067b	•		•	•		ST067b PSCAP compliance well
MW-141	U	115-135	OT069, SS030	•					OT069 LTMP well, annual sampling; ST067b PSCAP compliance well
MW-142	L	310-340	ST067b	•		•	•		ST067b PSCAP compliance well
MW-143	L	280-310	ST067b, OT071	•		•	•	•	Monitor vertical migration of ST067b benzene plume; Monitor dieldrin concentrations within Lower Aquifer OT071 plume; ST067b PSCAP compliance well
MW-144	U	143-163	ST067b, OT071	•		•	•	•	Clean well between ST067b and OT071 plumes; ST067b PSCAP compliance well
MW-145	L	270-300	ST067b, OT071	•		•	•	•	ST067b PSCAP compliance well
MW-146	U	136-156	ST067b, OT071	•		•	•	•	ST067b PSCAP compliance well
MW-147	L	310-340	ST067b, OT071	•		•	•	•	ST067b PSCAP compliance well
MW-148	L	230-260	OT071					•	
MW-149	L	210-240	OT071					•	
MW-150	U	155-175	ST067b	•		•	•		
MW-151	L	275-305	ST067b, OT071	•		•	•	•	ST067b PSCAP compliance well
MW-152	L	270-300	OT071					•	
MW-153	U	152-173	ST067b	•		•	•		ST067b PSCAP compliance well
MW-154	U	156-176	ST067b	•		•	•		ST067b PSCAP compliance well
MW-155	U	157.5-187.5	ST067b	•		•	•		ST067b PSCAP compliance well
MW-157	U	179-189	ST067b	•		•	•		ST067b PSCAP compliance well
MW-158	U	160-180	ST067b	•		•	•	•	ST067b PSCAP compliance well
NZ-03	L	130-150	CG070, LF014	•		•			
NZ-13	L	155-185	LF014	•		•			
NZ-15	U	152-182	SS030	•					
NZ-58	L	142-163	LF014	•		•			
NZ-60	L	275-295	LF012	•		•	•		

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Monitoring Well Summary
April 2015 Basewide Groundwater Monitoring Event
Former George Air Force Base, California

Monitoring Well	Aquifer	Screen (ft bgs)	Associated Site	VOCs	Nitrate	GEO	GEO Extra	Dieldrin	Rationale
NZ-61	L	265-285	LF012	•		•	•		
NZ-62	L	274-294	LF012	•		•	•		
NZ-63	U	131-151	OT071					•	
NZ-64	L	277-297	OT071					•	
NZ-65	L	268-288	OT071					•	
NZ-66	U	65-85	OT071					•	
NZ-72	L	201-221	CG070	•					
NZ-80	L	258-278	CG070, LF044	•		•			
NZ-89	U	117-137	OT071					•	
NZ-91	U	55-70	OT071					•	
NZ-107	L	260-280	CG070, LF014	•		•			
NZ-108	L	258-278	CG070, LF012	•		•	•		
NZ-112	L	180-200	CG070, LF044	•		•			
NZ-113	L	133-153	CG070, LF044	•		•			
NZ-119	U	148-168	ST067b	•		•	•	•	ST067b PSCAP compliance well
NZ-120	U	98-118	OT071					•	
NZ-121	U	14-29	OT071					•	
NZ-122	U	55-75	OT071					•	
NZ-123	U	33-48	OT071					•	
NZ-124	U	140-156	OT071					•	
NZ-125	U	140-160	OT071	•		•	•	•	ST067b PSCAP compliance well
WZ-04	U	115-135	ZZ051	•					
WZ-05	U	115-135	ZZ051	•					
WZ-06	U	115-135	ZZ051	•					

Notes:

April 2015 Event includes sampling 117 wells (102 VOC samples, 56 geochemical samples, 49 geo extra samples, and 27 dieldrin samples).

FP - Flood Plain Aquifer

GEO - Geochemical parameters include chloride, nitrate, sulfate, total dissolved solids.

GEO Extra - Additional geochemical parameters needed for geochemical evaluation may include:

total alkalinity, filtered major cations (calcium, magnesium, sodium, potassium), and field measurements of sulfide and ferrous iron

L - Lower Aquifer

TCE - Trichloroethene.

U - Upper Aquifer

VOCs - Volatile organic compounds.

FIGURES

Wells to be Sampled

ADELANTO-4	MW-91	MW-148
MW-01-OU3	MW-99	MW-149
MW-02	MW-109	MW-150
MW-04	MW-110	MW-151
MW-13	MW-111	MW-152
MW-16	MW-112	MW-153
MW-21	MW-113	MW-154
MW-23	MW-114	MW-155
MW-26	MW-115	MW-157
MW-28	MW-116	MW-158
MW-29	MW-117	NZ-03
MW-30	MW-118	NZ-13
MW-31	MW-119	NZ-15
MW-33	MW-120	NZ-58
MW-34	MW-121	NZ-60
MW-35	MW-123	NZ-61
MW-36	MW-124	NZ-62
MW-38	MW-125	NZ-63
MW-39	MW-126	NZ-64
MW-40	MW-127	NZ-65
MW-42	MW-128	NZ-66
MW-43	MW-129	NZ-72
MW-44	MW-130	NZ-80
MW-45	MW-131	NZ-89
MW-46	MW-132	NZ-91
MW-47	MW-133	NZ-107
MW-48	MW-134	NZ-108
MW-49	MW-136	NZ-112
MW-51	MW-137	NZ-113
MW-55	MW-138	NZ-119
MW-57	MW-139	NZ-120
MW-58	MW-140	NZ-121
MW-61	MW-141	NZ-122
MW-69	MW-142	NZ-123
MW-70B	MW-143	NZ-124
MW-71	MW-144	NZ-125
MW-74	MW-145	WZ-04
MW-75	MW-146	WZ-05
MW-88	MW-147	WZ-06

SEE INSET

LEGEND

- Free Product Extraction Well
- Vapor Monitoring Point
- Groundwater Monitoring Well
- Vapor Extraction Well
- Vapor Monitoring Well
- Water Supply Well
- Inactive Supply Well
- Well to be Sampled April 2015
- Topogaphic Contour (ft msl)
- Former George Air Force Base Boundary

0 900 1,800 3,600

Feet

1 inch = 1,800 feet

N

CB&I Federal Services LLC
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FORMER GEORGE AIR FORCE BASE
VICTORVILLE, CALIFORNIA

FIGURE 1

WELLS TO BE SAMPLED
APRIL 2015

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